

ABC of Eyes

Injury to the eye

P T Khaw, P Shah, A R Elkington

An injury to the eye or its surrounding tissues is the most common cause for attendance at an eye hospital emergency department.

History

How the injury was sustained gives clues about what to look for during the examination. If there is a history of any high velocity injury (particularly a hammer and chisel injury) or if glass was involved, a penetrating injury must be strongly suspected and excluded. If there has been a forceful blunt injury (such as a punch), signs of a "blowout" fracture should be sought. The circumstances of the injury must be carefully recorded as they may have important medicolegal implications. It may not be possible to get an accurate and reliable history from children if an adult has not witnessed the injury. Such injuries should be treated with a high index of suspicion, as a penetrating eye injury may be present.

Examination

A good examination is vital if there is a history of eye injury. Specific signs must be looked for or they will be missed. It is vital to test the visual acuity, both to establish a baseline value and to alert the examiner to the possibility of further problems. However, an acuity of 6/6 does not necessarily exclude serious problems—even a penetrating injury. The visual acuity may also have considerable medicolegal implications. Local anaesthetic may be needed to obtain a good view, and fluorescein is essential to ensure no abrasions are missed.

Corneal abrasions

Corneal abrasions are the most common result of blunt injury. They may follow injuries with foreign bodies, fingernails, or twigs. Abrasions will be missed if fluorescein is not instilled. The three aims of treatment are to:

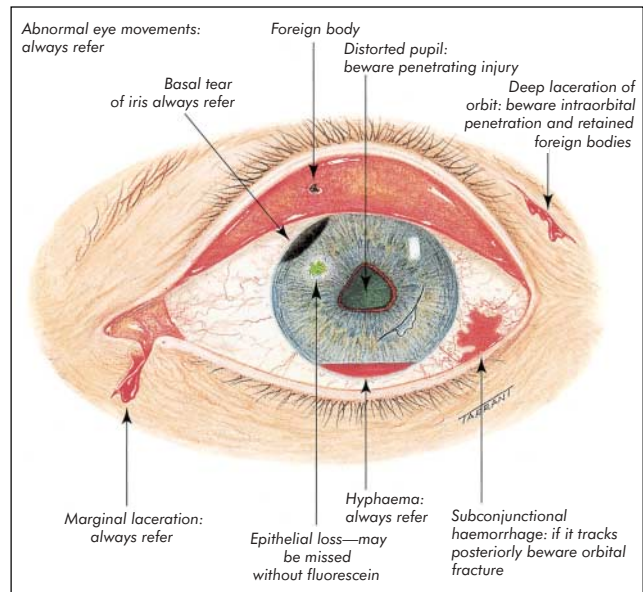
- Speed healing and protect the eye—pad the eye
- Prevent infection—apply chloramphenicol ointment
- Relieve pain—instil a cycloplegic drug (cyclopentolate 1% or homatropine 2%) and give oral analgesia if necessary.

The cycloplegic will relieve ciliary spasm and dilate the pupil. The patient should use an eye pad for a day or so if the abrasion is large. Chloramphenicol drops for a few more days will help prevent infection and lubricate the eye.

Recurrent abrasions

Occasionally, the corneal epithelium may repeatedly break down if the patient has had a previous injury or has an inherently weak adhesion between the epithelial cells and the basement membrane. These recurrences usually occur at night when there is little secretion of tears, and the epithelium may be torn off. Treatment is long term and entails drops during the day and ointment at night to lubricate the eye. A surgical procedure (such as epithelial debridement or corneal stromal puncture) is sometimes carried out to enhance the adhesion between the epithelium and the underlying basement membrane.

This article is adapted from the 4th edition of the ABC of Eyes, which will be published by BMJ Books in February 2004 (www.bmjbooks.com).



The injured eye

Common types of eye injury

- Corneal abrasions
- Foreign bodies
- Radiation damage
- Chemical damage
- Blunt injuries with hyphaema
- Penetrating injuries



Corneal abrasion stained with fluorescein and illuminated with white light



Corneal abrasion stained with fluorescein and illuminated with blue light

Foreign bodies

It is important to identify and remove conjunctival and corneal foreign bodies. A patient may not recall a foreign body having entered the eye, so it is essential to look for a foreign body if a patient has an uncomfortable red eye. A local anaesthetic may be needed both to examine the eye and to remove the foreign body. Local anaesthetics should never be given to patients to use themselves because they impede healing and further injury may occur to an anaesthetised eye.

Small loose conjunctival foreign bodies can be removed with the edge of a tissue or a cotton wool bud or washed out with water. The upper lid must be everted to exclude a subtarsal foreign body, particularly if there are corneal scratches or a continuing feeling that a foreign body is present. However, this should not be done if a penetrating injury is suspected.

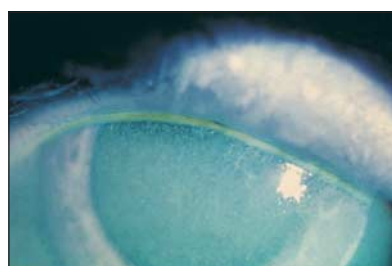
Corneal foreign bodies are often more difficult to remove if they are metallic because they are often "rusted on." They must be removed as they will prevent healing and rust may permanently stain the cornea. A cotton wool bud or the edge of a piece of cardboard can be used. If this does not work, a needle tip (or special rotary drill) can be used, but great care must be taken as the eye may easily be damaged. If there is any doubt, these patients should be referred to an ophthalmologist. When the foreign body has been removed any remaining epithelial defect can be treated as an abrasion.



Lower lid gently pulled down to show a conjunctival foreign body. The cornea has also been perforated



Subtarsal foreign body



Cornea after welding damage, stained with fluorescein and illuminated with blue light



Chemical injury to the eye



Hyphaema

Radiation damage

The most common form of radiation damage occurs when welding has been carried out without adequate shielding of the eye. The corneal epithelium is damaged by the ultraviolet rays and the patient typically presents with painful, weeping eyes some hours after welding. This condition is commonly known as arc eye.

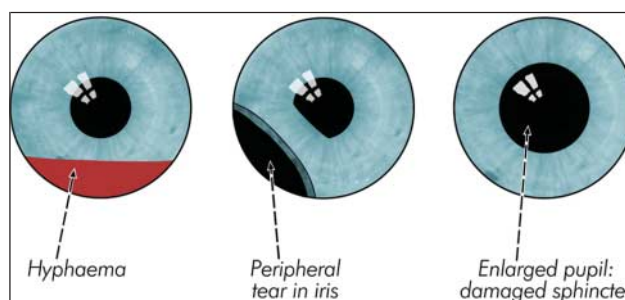
Radiation damage can also occur after exposure to large amounts of reflected sunlight (for example, snow blindness) or after ultraviolet light exposure in tanning machines. Treatment is as for a corneal abrasion.

Chemical damage

All chemical eye injuries are potentially blinding injuries. If chemicals are splashed into the eye, the eye and the conjunctival sacs (fornices) should be washed out immediately with copious amounts of water. Acute management should consist of the three "I's": irrigate, irrigate, irrigate. Alkalis are particularly damaging, and any loose bits such as lime should be removed from the conjunctival sac with the aid of local anaesthetic if necessary. The patient should then be referred immediately to an ophthalmic department. If there is any doubt, irrigation should be continued for as long as possible with several litres of fluid.

Blunt injuries

When a large object (such as a football) hits the eye, most of the impact is usually taken by the orbital margin. However, if a smaller object (such as a squash ball) hits the area, the eye itself may take most of the impact. Haemorrhage may occur and a collection of blood may be visible in the anterior chamber of the eye (hyphaema). Patients who sustain such injuries need to be reviewed at an eye unit as the pressure in the eye may rise, and further haemorrhages may require surgical intervention. Haemorrhage may also occur into the vitreous or in the retina, and this can be accompanied by a retinal detachment. All



Signs of damage to the eye itself

patients with visual impairment after blunt injury should be seen in an ophthalmic department.

The iris may also be damaged and the pupil may react poorly to light. This is particularly important in a patient with an associated head injury, as this may be interpreted as (or mask) the dilated pupil that is suggestive of an acute extradural haematoma. The lens may be damaged or dislocated and a cataract may develop. Damage to the drainage angle of the eye (which cannot be seen without a mirror contact lens and a slit lamp microscope) increases the chances of glaucoma developing in later life.

If the force of impact is transmitted to the orbit, an orbital fracture may occur (usually in the floor, which is thin and has little support). Clues to the presence of an inferior blowout fracture include diplopia, a recessed eye, defective eye movements (especially vertical), an ipsilateral nose bleed, and diminished sensation over the distribution of the infraorbital nerve. The fracture may need repair, and these patients should be referred to an ophthalmic department.

Penetrating injuries and eyelid lacerations

Lacerations of the eyelids need specialist attention if:

- The lid margins have been torn—these must be sewn together accurately
- The lacrimal ducts have been damaged—lacerations affecting the medial end of the eyelid are likely to damage the lacrimal ducts, and these may need to be reapposed under the operating microscope
- There is any suspicion of a foreign body or penetrating eyelid injury—objects may easily penetrate the orbit and even the cranial cavity through the orbit.

Penetrating injuries of the eye can be easily missed because they may seal themselves and the signs of abnormality are subtle. Any history of a high velocity injury (particularly a hammer and chisel injury) should raise strong suspicions of a penetrating injury. The eye should be examined very gently without putting any pressure on the globe. Prolapse of the intraocular contents and irreversible damage can be caused if the eye and orbit are not examined carefully.

Signs to look for include a distorted pupil, cataract, prolapsed black uveal tissue on the ocular surface, and vitreous haemorrhage. The pupil should be dilated (if there is no head injury) and a thorough search made for an intraocular foreign body. If an intraocular or orbital foreign body is suspected, orbital radiographs, with the eye in up and down gaze, should be taken. If the eye is clearly perforated, a shield should be applied to protect it from any pressure and the patient should be sent immediately to the nearest eye department.

Sympathetic ophthalmia, in which chronic inflammation develops in the uninjured eye, is a potentially serious complication of any severe penetrating eye injury. The risk of this increases if a penetrating eye injury is left untreated. All penetrating eye injuries should receive immediate specialist ophthalmic management without delay.

The ABC of Eyes is written by P T Khaw, professor of ophthalmology at Moorfields Eye Hospital, London (p.khaw@ucl.ac.uk), P Shah, consultant ophthalmic surgeon at Birmingham and Midland Eye Centre, Birmingham (p.f.shah@talk21.com), and A R Elkington, emeritus professor of ophthalmology, University of Southampton.

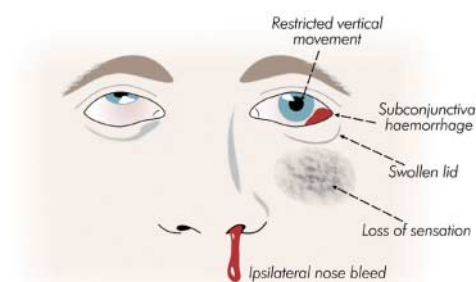
The photographs were provided by PTK and Moorfields Eye Hospital and the line drawings were prepared by Alan Lacey, Moorfields Eye Hospital.

Competing interests: PS and PTK have received educational and research grants from pharmaceutical companies.

BMJ 2004;328:36–8



Radiograph showing blowout fracture of the left orbit with fluid in the maxillary sinus



Signs of a left orbital blowout fracture (patient looking upwards)



Lacerated eyelid

Objects likely to cause penetrating eye injuries

- Hammer and chisel
- Glass
- Knives
- Thorns
- Darts
- Pencils



Penetrating eye injury